

REMARKS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1, 3-10, 12-25, and 27-45 are currently pending. Claims 2, 11, and 26 have been canceled without prejudice, and Claims 1, 3, 5, 9, 12, 14, and 15 have been amended by the present amendment. The changes to the claims are supported by the originally filed specification and do not add new matter.

In the outstanding Office Action, Claims 1, 3-10, and 12-27 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 5,444,478 to Lelong et al. (hereinafter “the ‘478 patent”); Claims 1, 6, 7, 9, 15, 16, and 28-45 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent No. 389,179 to Katayama et al. (hereinafter “the ‘179 patent”);¹ Claims 2 and 11 were rejected under 35 U.S.C. § 103(a) as being unpatentable over the ‘478 patent in view of U.S. Patent No. 6,507,366 to Lee (hereinafter “the ‘366 patent”); and Claim 26 was rejected under 35 U.S.C. § 103(a) as being unpatentable over the ‘478 patent in view of U.S. Patent No. 6,304,313 to Honma (hereinafter “the ‘313 patent”).

Applicants wish to thank the Examiner for the interview granted Applicants’ representative on March 8, 2007, at which time the outstanding rejection of the claims was discussed. At the conclusion of the interview, the Examiner indicated that the ‘478 patent does not disclose the tangible object plane, which is defined by a spatial orientation, as recited in the claims. In particular, the Examiner indicated that the “current claim language” overcomes the ‘478 patent.² In addition, the Examiner indicated that the ‘179 patent, rather than the ‘478 patent, should have been cited in Item 4 of the previous Office Action.

¹ Applicants note that the ‘179 patent is not listed on a PTO Form 892.

² See Interview Summary dated March 8, 2007.

Amended Claim 1 is directed to an image processing method for correcting image distortions, comprising the steps of: (1) inputting a plurality of partially overlapping images of a tangible object on an object plane, the plurality of partially overlapping images sharing a common location of the tangible object and being created by capturing a tangible object on the tangible object plane from different directions to the tangible object plane; (2) determining a feature point of one of the plurality of partially overlapping images corresponding to the common location of the tangible object, and determining a matched point of one of the other partially overlapping images corresponding to the feature point so that a direction of the tangible object plane is calculated based on the feature point and the matched point, the tangible object plane being defined by a spatial orientation of the tangible object; (3) selecting one of the plurality of partially overlapping images as a standard image whose distortions are to be corrected, the selection being based on one of a direction of a straight-line pattern contained in each image, the feature point and the matched point determined in the determining step, and a calculated direction of the object plane for each of the partially overlapping images; and (4) generating a distortion-corrected image on a projection plane by projecting the standard image onto the projection plane based on the direction of the tangible object plane such that image distortions of the standard image are eliminated. The changes to Claim 1 are supported by the originally filed specification and do not add new matter.³

The '478 patent is directed to a method of processing images for constructing a target image from adjacent source images I_1, \dots, I_n . As shown in Figure 1G, the '478 patent discloses that, for example, three cameras having a common viewpoint P have three corresponding image planes I_1, I_2 , and I_3 , and corresponding optical axes PZ_1, PZ_2 , and PZ_3 . As illustrated in Figures 5A, 5B, and 7C, the '478 patent discloses a system in which a

³ See, e.g., original Claims 3-5.

target image I₀ is constructed based on the source images I₁ to I_n by selecting a point m' on the target image plane I₀, projecting through the point m' from viewpoint P, and determining a corresponding point on one of the image planes I₁-I_n along the projection direction.

Further, the '487 patent discloses that the pixel value at the intersection point on one of the image planes is used for a pixel value at m' on the target image plane I₀. Further, as shown in Figure 7D, the '478 patent discloses that the image thus created for the virtual image plane I₀ can be processed to remove distortion and perspective faults.

However, Applicants respectfully submit that the '478 patent fails to disclose the step of inputting a plurality of partially overlapping images of a tangible object on an object plane, the plurality of partially overlapping images sharing a common location of the tangible object and being created by capturing the target object tangible object on the tangible object plane from different directions to the tangible object plane, as recited in amended Claim 1. Rather, the '478 patent discloses multiple *image* planes corresponding to cameras C₁-C_n, and a virtual *image* plane I₀, which is unrelated to the claimed tangible object plane. In particular, Applicants respectfully submit that the '478 patent fails to disclose a tangible object plane being defined by a spatial orientation of a tangible object. Moreover, the '478 patent does not disclose calculating a direction of the tangible object plane based on the feature point and the matched point. The process of generating the image shown in Figure 7c of the '478 patent is based on selecting pixel values from either image I_i or I_j, or by interpreting pixel values obtained from the two images.

Further, Applicants note that, in the interview on March 8, 2007, it was agreed that the claims patentably define over the '478 patent. For the reasons stated above, Applicants respectfully traverse the rejection of Claim 1 as anticipated by the '478 patent.

Independent Claims 6, 7, 9, 15, and 16 recite limitations analogous to the limitations recited in Claim 1. Accordingly, for reasons analogous to the reasons stated above for the

patentability of Claim 1, Applicants respectfully traverse the rejections of Claims 6, 7, 9, 15, and 16 (and all similarly rejected dependent claims) as anticipated by the '478 patent.

Regarding the rejection of Claim 1 as anticipated by the '179 patent, the '179 patent is directed to an image combining apparatus for generating a combined image by combining a plurality of images of an object so that frames partially overlap each other. In particular, the '179 patent discloses means for discriminating an overlapping area between the plurality of images based on information stored in the storage means; means for detecting a correspondence between certain pixels present in a search area set by the discriminating means; and image combining means for generating a panoramic image by combining a series of images stored in the storage means based on the correspondence information obtained by the means for detecting the correspondence between the pixels present in the search area. See Figures 6-8 of the '179 patent. As shown in Figure 6, and '179 patent discloses that the rotation angles of the X, Y, and Z axes are used as parameters when moving the electronic camera 100, and that when the three images I21, I22, and I23 are combined, coordinate transforming processing is made based on the parameters, to thus obtain the combined image I24 shown in Figure 8, which is free from any trapezoidal distortion.⁴

However, Applicants respectfully submit that the '179 patent fails to disclose selecting one of the plurality of partially overlapping images as a standard image whose image distortions are to be corrected, the selection being based on one of (1) a direction of a straightline pattern contained in each image, (2) the feature point and the matched point determined in the determining step, and (3) a calculated direction of the object plane for each of the partially overlapping images, as recited in amended Claim 1. The '179 patent is silent regarding the basis of selecting the standard image, as recited in amended Claim 1. In this regard, Applicants note that amended Claim 1 recites limitations recited in original

⁴ See '179 patent, col. 10, line 64 to col. 11, line 3.

Claims 3-5, which were not rejected based on the '179 patent. Accordingly, for the reasons stated above, Applicants respectfully submit that the rejection of Claim 1 (and all similarly rejected dependent claims) is rendered moot by the present amendment to Claim 1.

Independent Claims 9 and 15 recite limitations analogous to the limitations recited in Claim 1. Moreover, Claims 9 and 15 have been amended in a manner analogous to the amendment to Claim 1. Accordingly, for reasons analogous to the reasons stated above for the patentability of Claim 1, Applicants respectfully submit that the rejections of Claims 9 and 15 (and all similarly rejected dependent claims) are rendered moot by the present amendment to Claims 9 and 15.

Independent Claim 6 is directed to an image processing method for correcting image distortions, comprising the steps of: (1) inputting a plurality of partially overlapping images of a tangible object on an object plane, a plurality of partially overlapping images sharing a common location of the tangible object and being created by capturing the tangible object on the tangible object plane from different directions to the tangible object plane; (2) determining a feature point of one of the plurality of partially overlapping images corresponding to the common location of the tangible object, and determining a matched point of one or the other partially overlapping images corresponding to the feature point of the one of the plurality of partially overlapping images so that a direction of a tangible object plane is calculated based on the feature point and the matched point, the tangible object plane being defined by a spatial orientation of the tangible object; (3) selecting one of the plurality of partially overlapping images as a standard image that contains a smallest amount of image distortions among the plurality of partially overlapping images; and (4) combining the other partially overlapping images, which are projected onto an image surface of the standard image with respect to each of the other partially overlapping images, so that a composite

image is generated on the image surface so as to correct image distortions in the standard image.

As discussed above, the '179 patent is directed to an image combining apparatus for generating a single image by combining a plurality of sensed images. However, Applicants respectfully submit that the '179 patent fails to disclose the step of selecting one of the plurality of partially overlapping images as a standard image that contains a smallest amount of image distortions among the plurality of partially overlapping images, as recited in Claim 6. In this regard, Applicants note that the Office Action, on page 9, asserts that the selecting step is taught by column 10, lines 49-57 of the '179 patent. However, Applicants note that this section of the '179 patent merely states, in reference to Figs. 6-8, that trapezoidal distortions are produced in object images I21 and I23 at two ends of the landscape 20 with reference to the image I22 corresponding to the central region R22 of the landscape 20. However, the '179 patent does not disclose that the standard is selected based on a smallest amount of image distortions among the plurality of partially overlapping images, as required by Claim 6. In this regard, Applicants note that Claim 6 requires that the image distortions are corrected in the standard image which is selected in the selecting step. Thus, the image that is selected in the selecting step to have image distortions corrected is the image containing a smallest amount of image distortions among the plurality of partially overlapping images. Thus, for the reasons stated above, Applicants respectfully traverse the rejection of Claim 6 as anticipated by the '179 patent.

Independent Claims 7 and 16 recite limitations analogous to the limitations recited in Claim 6. Accordingly, for the reasons stated above, Applicants respectfully traverse the rejection of Claims 7 and 16 (and all similarly rejected dependent claims) as anticipated by the '179 patent.

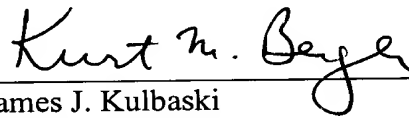
Applicants respectfully submit that the rejection of Claims 2, 11, and 26 are rendered moot by the present cancellation of those claims.

Thus, it is respectfully submitted that independent Claims 1, 6, 7, 9, 15, and 16 (and all associated dependent claims) patentably define over any proper combination of the '179, '478, '366, and '313 patents.

Consequently, in view of the present amendment and in light of the above discussion, the outstanding grounds for rejection are believed to have been overcome. The application as amended herewith is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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